**REVIEW OF RELATED LITERATURE**

**I. What is an air-conditioning unit?**

1. The history of air con

- Air conditioning was, in days gone by, a preserve of the rich. Even as far back as Ancient Egypt and Ancient Persia, some form of primitive air conditioning system was in use in the palaces of the wealthy aristocrats. These early air conditioning units were based on using water, sometimes in conjunction with cold air, to cool the brickwork of the buildings. This kind of use for a valuable resource such as water, especially in the desert, was extravagant in the extreme and obviously only available to the ruling classes.

The idea of air conditioning started before a machine was created to produce the cooling effect desired. The first attempt at building an air conditioner was made by Dr. John Gorrie (1803-1855), an American physician, in Apalachicola, Florida. During his practice there in the 1830s, Dr. Gorrie creating an ice-making machine that essentially blew air over a bucket of ice for cooling hospital rooms of patients suffering from malaria and yellow fever.

In 1881, when President James Garfield was dying, naval engineers constructed a box-like structure containing cloths saturated with melted ice water, where a fan blew hot air overhead. This contraption was able to lower a room by 20 degrees Fahrenheit but consumed half a million pounds of ice in two months' time.

2. The inventor of the air con

- A close ancestor to the modern air conditioner units was first made in 1902 by an American engineer by the name of [Willis Carrier](http://www.invent.org/book/book-text/22.html). The machine at that time was called "Apparatus for Treating Air" and was built for the Sackett-Wilhelms Lithographing and Publishing Co. in Brooklyn, New York. Chilled coils were used in the machine to cool air and lower humidity to 55%, although the apparatus was made with enough precision that the humidity level desired was adjustable.

After the invention by Carrier, air conditioners began to bloom. They first hit the industrial buildings such as printing plants, textile mills, pharmaceutical manufacturers, and a few hospitals. The first air-conditioned home was that of Charles Gates, son of gambler John "Bet a Million" Gates, in Minneapolis in 1914. However, during the first wave of their installation, Carrier's air conditioner units were large, expensive, and dangerous due to the toxic ammonia that was used as coolant.

In 1922, Carrier had two breakthroughs - he replaced the ammonia with the benign coolant dielene and added a central compressor to reduce the size of the unit. The next advance was when Carrier sold his invention to movie-theater operators, with a notable debut in 1925 at the Rivoli on Broadway in New York City. In a short amount of time, air conditioners were installed in office buildings, department stores and railroad cars. The United States House of Representatives had air conditioners installed in 1928, with the Senate, White House and Supreme Court following suit in the years after. After World War II, window units air conditioners appeared, with sales escalating from 74,000 in 1948 to 1,045,000 in 1953.

3. The different types of air con

a**.** [**Window air conditioner**](http://www.brighthub.com/engineering/mechanical/articles/898.aspx) is the most commonly used air conditioner for [single](http://www.brighthub.com/engineering/mechanical/articles/897.aspx) rooms. In this air conditioner all the components, namely the compressor, condenser, expansion valve or coil, evaporator and cooling coil are enclosed in a single box. This unit is fitted in a slot made in the wall of the room, or often a window sill.

b. The [**split air conditioner**](http://www.brighthub.com/tools/) comprises of two parts: the outdoor unit and the indoor unit. The outdoor unit, fitted outside the room, houses components like the compressor, condenser and expansion valve. The indoor unit comprises the evaporator or cooling coil and the cooling fan.

c. [**Central air conditioning system**](http://www.brighthub.com/engineering/mechanical/articles/906.aspx): The central air conditioning system is used for cooling big buildings, houses, offices, entire hotels, gyms, movie theaters, factories etc. The central air conditioning system is comprised of a huge compressor that has the capacity to produce hundreds of tons of air conditioning. Cooling big halls, malls, huge spaces, galleries etc is usually only feasible with central conditioning units.

d. **Wall mounted:** wall mounted air conditioners are permanently mounted air conditioners and is suitable for room size, which may vary from 38 meter square- 93 meter square. Wall mounted as well as window mounted comes in cooling or cooling/heating varieties.

4. The differences of old and new models of air con

|  |  |
| --- | --- |
| Old Model | NewModel |
| More efficient with higher EER (Energy Efficient Ratio) | Less Efficient |
| Operates more quietly | Operates noisily |
| New switches like fan-only and automatic-delay fan | Didn’t have switches like that |

5. Taking care of your air conditioner

- If you take care of your air conditioning unit, you could prolong its life and get the most use out of it. Generally you should be able to do most of the maintenance yourself. However, in the more serious cases, it would be better to hire a contractor.

The first and most simple step to take to prolong your air conditioner's life is to change the filter. You should change it whenever it gets dirty. Depending on the usage, that could range from every three to six months. There are some filters out there, which can last up to a year. Ask someone in the hardware store for more tips!  
  
Once a year be sure that you check the evaporator coil located inside the air handler to make sure there is no dust build up.   
  
When the weather starts to cool you should check the outside of the air conditioning. You should check around the unit and make sure there is no debris on the surface of the condenser that will stop airflow. Also you should check between the fins of the condenser to see that it's not plugged with dead bugs or pollen. Spraying the condenser with a hose will usually be good enough to get rid of all the debris.

**II. Relation to science**

1. Concept 1

* Heat transfer is the flow of heat from a higher temperature to that of a lower temperature due to differences in temperature. This is one of the basic principles involved in a heat pump.

1. Concept 2

* Temperature is the measure of hotness or coldness of a body. It is also the average KE and PE of the substance. In a heat pump, aside from heat, temperature is also involved here.

1. Concept 3

* Latent heat is the energy needed to overcome the molecular interactions that tend to organize matter, such that it can undergo a phase change into a more disorganized state. It is also involved in a heat pump when the warm air changes from one temperature to another.

1. Concept 4

* It uses the same concept as a refrigerator, which uses a heat pump. A heat pump is a device that transfers heat energy from a low-temperature reservoir to high-temperature reservoir. And this relationship between two bodies of unequal temperature is also known as the 2nd Law of Thermodynamics.

1. Concept 5

* When a gas is compressed, the number of molecular collisions increases due to the increased concentration of molecules, and its temperature rises. This is sometimes referred to as Gay-Lussac's Law, which is a special case of the Ideal Gas Law, and it can be easily demonstrated with a deflated bicycle tire and hand pump. As the tire is inflated and its internal pressure rises, even greater external pressure is needed to force air into the tire. Increased compression is required with each additional stroke, and the temperature of the pumped air volume increases according to Gay-Lussac's Law. After several strokes this creates a significant temperature gradient, and heat spontaneously flows from the compressed air to the surrounding pump body, which begins to feel quite warm.

**III.** Ongoing studies about air conditioners

**Ongoing Research Relevant for Solar Assisted Air Conditioning Systems**

**Overview:** Solar-assisted air conditioning offers opportunities to meet the increasing cooling demand in buildings all over the world in an energy-efficient way. This report presents an overview of ongoing and recently completed R&D work, relevant for solar-assisted air conditioning. Descriptions of the projects that have been identified by Task 25 participants form the backbone of this report. It further includes information form Internet searches and selected conference proceedings. The structure of the report reflects the solar-assisted air conditioning system itself, which consists of solar collectors on the one hand, and a heat-driven chiller/dehumidifier on the other.

**IV. Sources**

Internet

* http://ezinearticles.com/?Air-Conditioning--The-History-Of-Air-Conditioning&id=600766)
* http://www.facstaff.bucknell.edu/mvigeant/therm\_1/ac\_final/bg.htm)
* <http://www.brighthub.com/engineering/mechanical/articles/897.aspx>
* http://www.house-energy.com/Air-Conditioning/High-rated-conditioning.htm
* http://www.geo4va.vt.edu/A3/A3.htm
* http://jobfunctions.bnet.com/abstract.aspx?docid=130009

Books

* Practical and Explorational Physics (page 236)
* Practical and Explorational Physics (page 220)
* Practical and Explorational Physics (page 216)
* The New Book of Knowledge